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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/010,696

12/05/2001

Visvamohan Yegnashankaran

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EXAMINER

VU, QUANG D

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 01/30/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/010,696

Applicant(s)

YEGNASHANKARAN ET AL.

Examiner

Quang D Vu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on amendment filed on 11/19/02.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-44 is/are pending in the application.
- 4a) Of the above claim(s) 11-25 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 3, 4, 6, 7, 10 and 26-44 is/are rejected.
- 7) ☒ Claim(s) 2, 5, 8 and 9 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 26-37 and 40 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Figure 12b discloses a second dielectric [736] that contacts only the third metal line [316]. The specification never discloses a second dielectric that contact the second metal line as claimed in claim 26.

The specification never discloses the second plurality of metal lines that lie substantially the same plane as the first plurality of metal lines as claimed in claim 33. The specification also never discloses the second plurality of metal lines including third, fourth, and fifth metal lines as claimed in claim 33. The specification (fig. 12B) only discloses the first plurality of metal lines including first, second, and third metal lines.

The specification never discloses the first dielectric is laterally formed between the fourth metal line and the fifth metal line as claimed in claim 34.

The specification never discloses the fifth metal line contacts the fifth metal line as claimed in claim 35.

The specification never discloses the second dielectric contacts a sidewall of the fifth metal line and a sidewall of the sixth metal line as claimed in claim 36.

The specification never discloses the second dielectric contacts the fourth metal line as claimed in claim 37.

The specification and fig.12B never disclose the second dielectric contacts a sidewall of the second metal line as claimed in claim 40.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 7, 10, 31-33 and 43-44 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 7, in lines 1-4, the phrase "...wherein the dielectric structure has a layer of material formed to adjoin a layer of insulation material, the layer of material being different from the layer of insulation material" is unclear. Claim 1 has disclosed the dielectric structure being formed from a dielectric material, which is different from the dielectric material of one of the layers of insulation material. It is unclear why claim 7 repeats the claim limitation of claim 1.

Claim 10, in lines 19-20, the phrase "...a capacitive structure formed between adjacent metal lines of a patterned metal layer, the capacitive structure being formed from a dielectric material..." is unclear. Figure ⁵⁸~~4B~~ shows that the dielectric structure [346] formed between the adjacent metal lines of a pattern metal layer. The phrase should be change to "...a dielectric structure formed between adjacent metal lines of a patterned metal layer, the dielectric structure

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comprising a dielectric material...”. In lines 23-24, the phrase “...a second trench being filled with the capacitive structure” is unclear. Figure 5B shows that the second trench filled with the dielectric material. The phrase should be change to “...a second trench being filled with the dielectric material”.

Claim 31, in lines 1-2, the phrase “...the second dielectric material is formed between the third dielectric that contacts the bottom surfaces of the second and third metal lines” is unclear. The specification and figure 11B only disclose the second dielectric material [736] forms on the third dielectric [712] that contacts the bottom surfaces of the second and third metal lines.

Claim 32, in lines 1-2, the phrase “...wherein the first dielectric and the third dielectric are different” is unclear as to what is being different between the first and third dielectrics.

Claim 33, in lines 1-3, the phrase “...further comprising a second plurality of metal lines that lie in substantially a same plane, the second plurality of metal lines including third, fourth, and fifth metal lines...” is unclear whether the second plurality of metal lines lie in substantially the same plane as in claim 26.

Claim 43, in lines 1-2, the phrase “...the second dielectric material is formed between the third dielectric that contacts the top surfaces of the second and third metal lines” is unclear. The specification and figure 12B only disclose the second dielectric material [736] forms on the third dielectric that contacts the top surfaces of the second and third metal lines.

Claim 44, in lines 1-2, the phrase “...wherein the first dielectric and the third dielectric are different” is unclear as to what is being different between the first and third dielectrics.

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5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

6. Claims 1 and 7 are rejected under 35 U.S.C. 102(e) as being anticipated by US Patent No. 6,262,446 to Koo et al.

Regarding claim 1, Koo et al. (figure 4) teach a multilevel metal interconnect formed on a semiconductor substrate, the semiconductor substrate having a plurality of active areas, the multilevel metal interconnect comprising:

a plurality of layers of insulation material (12, 30, 34), the plurality of layers of insulation material including a first layer of insulation material (12) and a top layer of insulation material (34), the first layer of insulation material (12) being formed on the semiconductor substrate (10);

a corresponding plurality of patterned metal layers (16a-e; 32a-d; 36a-d) formed on the layers of insulation material (12, 30, 34) so that each patterned metal layer is formed on a corresponding layer of insulation material, a patterned metal layer including a plurality of metal lines, the plurality of patterned metal layers including a first patterned metal layer (16a-e) and a top patterned metal layer (36a-d), the first patterned metal layer (16a-e) being formed on the first layer of insulation material (12);

a plurality of contacts (14a-e) formed through the first layer of insulation material (12) to make electrical connections with the active areas and the first patterned metal layer (16a-e);

a plurality of via formed through the plurality of layers of insulation material (30, 34) other than the first layer of insulation material (12), the vias making electrical connections with adjacent patterned metal layers.

a dielectric structure (17b) formed between laterally adjacent metal lines of a patterned metal layer (16e, 16g), the dielectric structure (17b) being formed from a dielectric material. It is inherent that the dielectric material being different from one of the layers of insulation material.

Regarding claim 7, Koo et al. teach the dielectric structure (17b) has a layer of material formed to adjoin a layer of insulation material (30). It is inherent that the layer of material being different from the layer of insulation material.

7. Claims 26-32 and 38-44 are rejected under 35 U.S.C. 102(e) as being anticipated by US Patent No. 6,222,269 to Usami.

Regarding claim 26, Usami (figure 1) teaches a multilevel metal interconnect comprising:
a first plurality of metal lines (3) that lie in substantially a same horizontal plane, the first plurality of metal lines (3) including first, second, and third metal lines, the first, second, and third metal lines each having a top surface, a bottom surface, and side wall surfaces that contact the top and bottom surfaces;

a first dielectric (4) that contacts the first metal line (3) (the sixth region from the left of fig. 1) and the second metal line (3) (the eighth region from the left of fig. 1) ; and

a second dielectric (5) that contacts the second metal line (3) (the eighth region from the left of fig. 1) and the third metal line (3) (the tenth region from the left of fig. 1), the second dielectric (5) being different from the first dielectric (4) (column 5, line 66 – column 6, line 9).

Regarding claim 27, Usami teaches the first dielectric (4) contacts a sidewall of the first metal line (3) (the sixth region from the left of fig. 1) and a sidewall of the second metal line (3) (the eighth region from the left of fig. 1).

Regarding claim 28, Usami teaches the second dielectric (5) contacts a sidewall of the second metal line (3) (the eighth region from the left of fig. 1) and a sidewall of the third metal line (3) (the tenth region from the left of fig. 1).

Regarding claim 29, Usami teaches the second dielectric (5) does not contact the first metal line (3) (the sixth region from the left of fig. 1).

Regarding claim 30, Usami teaches a third dielectric (2) that contacts the bottom surfaces of the first (the sixth region from the left of fig. 1), second (the eighth region from the left of fig. 1), and third (the tenth region from the left of fig. 1) metal lines.

Regarding claim 31, Usami teaches the second dielectric material (5) is formed on the third dielectric (2) that contacts the bottom surfaces of the second (the eighth region from the left of fig. 1) and third (the tenth region from the left of fig. 1) metal lines.

Regarding claim 32, Usami teaches the first dielectric (4) (column 6, lines 3-4) and the third dielectric (2) (column 6, line 48) are different.

Regarding claim 38, Usami (figure 1) teaches a multilevel metal interconnect comprising:
a first plurality of metal lines (3) that lie in substantially a same horizontal plane, the first plurality of metal lines (3) including first, second, and third metal lines, the first, second, and third metal lines each having a top surface, a bottom surface, and side wall surfaces that contact the top and bottom surfaces;

a first dielectric (4) that contacts the first metal line (3) (the sixth region from the left of fig. 1) and the second metal line (3) (the eighth region from the left of fig. 1); and

a second dielectric (5) that contacts the second metal line (3) (the eighth region from the left of fig. 1) and the third metal line (3) (the tenth region from the left of fig. 1), the second dielectric (5) being different from the first dielectric (4) (column 5, line 66 – column 6, line 9).

Regarding claim 39, Usami teaches the first dielectric (4) contacts a sidewall of the first metal line (3) (the sixth region from the left of fig. 1) and a sidewall of the second metal line (3) (the eighth region from the left of fig. 1).

Regarding claim 40, Usami teaches the second dielectric (5) contacts a sidewall of the second metal line (3) (the eighth region from the left of fig. 1).

Regarding claim 41, Usami teaches the second dielectric (5) does not contact first metal line (3) (the sixth region from the left of fig. 1).

Regarding claim 42, Usami teaches a third dielectric (6) that contacts the top surfaces of the first (the sixth region from the left of fig. 1), second (the eighth region from the left of fig. 1), and third (the tenth region from the left of fig. 1) metal lines.

Regarding claim 43, Usami teaches the second dielectric material (5) is formed under the third dielectric (6) that contacts the top surfaces of the second (the eighth region from the left of fig. 1) and third (the tenth region from the left of fig. 1) metal lines,

Regarding claim 44, Usami teaches the first dielectric (4) (column 6, lines 3-4) and the third dielectric (6) (column 6, line 48) are different in thickness.

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8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,262,446 to Koo et al.

Regarding claim 6, Koo et al. (figure 4) teach a multilevel metal interconnect formed on a semiconductor substrate, the semiconductor substrate having a plurality of active areas, the multilevel metal interconnect comprising:

a plurality of layers of insulation material (12, 30, 34), the plurality of layers of insulation material including a first layer of insulation material (12) and a top layer of insulation material (34), the first layer of insulation material (12) being formed on the semiconductor substrate (10);

a corresponding plurality of patterned metal layers (16a-e; 32a-d; 36a-d) formed on the layers of insulation material (12, 30, 34) so that each patterned metal layer is formed on a corresponding layer of insulation material, the plurality of patterned metal layers including a first patterned metal layer (16a-e) and a top patterned metal layer (36a-d), the first patterned metal layer (16a-e) being formed on the first layer of insulation material (12);

a plurality of contacts (14a-e) formed through the first layer of insulation material (12) to make electrical connections with the active areas and the first patterned metal layer (16a-e);

a plurality of via formed through the plurality of layers of insulation material (30, 34) other than the first layer of insulation material (12), the vias making electrical connections with adjacent patterned metal layers.

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a capacitive structure (20) formed between adjacent metal lines of a patterned metal layer (16e, 16g), the capacitive structure (20) being formed from a dielectric material (17b). It is inherent that the dielectric material being different from one of the layers of insulation material. It would have been obvious for the dielectric material including a plurality of layers of dielectric material because it depends on the ^{capacitance}~~capacitive structure~~ between adjacent metal lines.

10. Claims 33-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,222,269 to Usami.

Regarding claim 33, Usami differs from the claimed invention by not showing a second plurality of metal lines that lie in substantially a same plane, the second plurality of metal lines including third, fourth, and fifth metal lines that contact the third dielectric, the third, fourth, and fifth metal lines each having a top surface, a bottom surface, and sidewall surfaces. It would have been obvious to one having ordinary skill in the art at the time the invention was made for a second plurality of metal lines that lie in substantially a same plane, the second plurality of metal lines including third, fourth, and fifth metal lines that contact the third dielectric, the third, fourth, and fifth metal lines each having a top surface, a bottom surface, and sidewall surfaces, since an integrated circuit may comprise a mirror structure of claim 26 formed adjacent to the structure of a first plurality of metal lines. It is well known in the art that an integrated circuit may comprise a plurality of similar structures formed on the same substrate.

Regarding claim 34, Usami differs from the claimed invention by not showing the first dielectric is laterally formed between the fourth metal line and the fifth metal line. It would have been obvious to one having ordinary skill in the art at the time the invention was made for first

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dielectric is laterally formed between the fourth metal line and the fifth metal line for the reason discussed above.

Regarding claim 35, Usami differs from the claimed invention by not showing the first dielectric contacts the fifth metal line. It would have been obvious to one having ordinary skill in the art at the time the invention was made for the first dielectric contacts the fifth metal line for the reason discussed above.

Regarding claim 36, Usami differs from the claimed invention by not showing the second dielectric contacts a sidewall of the fifth metal line and a sidewall of the sixth metal line. It would have been obvious to one having ordinary skill in the art at the time the invention was made the second dielectric contacts a sidewall of the fifth metal line and a sidewall of the sixth metal line for the reason discussed above.

Regarding claim 37, Usami differs from the claimed invention by not showing the second dielectric does not contact the fourth metal line. It would have been obvious to one having ordinary skill in the art at the time the invention was made for the second dielectric does not contact the fourth metal line for the reason discussed above.

Allowable Subject Matter

Claims 2-4, 5, 8-9 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

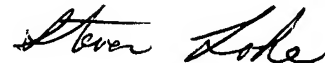
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Quang D Vu whose telephone number is 703-305-3826. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 703-308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

qv
January 27, 2003

A handwritten signature in cursive script, appearing to read "Steven Loke".